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Preliminary Evaluation of a Novel Simulation-Based Tool for Training Rapid Decision-Making Skills

Richard E. Christ
U.S. Army Research Institute

February 2006

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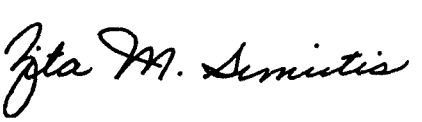

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14. ABSTRACT *(Maximum 200 words)*:

This report describes an initial evaluation of a desktop training tool named the Simulated Field Exercise (SimFX). SimFX is different from other desktop trainers in that it uses a discrete, outcome-driven simulation for training leader decision making rather than a simulation driven by inputs from the virtual operating environment. The training scenarios used in SimFX exploit the cognitive realism that occurs when the leader is engaged in an interactive, branching storyline. The SimFX simulation advances the leader from one decision point to the next, and therefore focuses the leader on making decisions using available information rather than on experiencing the subtleties of a virtual environment. The SimFX was evaluated using the results from a questionnaire completed by 19 participants in a hands-on workshop that was conducted to introduce SimFX to a broad cross-section of trainers and training developers at Fort Benning, Georgia. The findings of this preliminary evaluation of SimFX suggest that it may be both an effective and an efficient means to train information-processing and decision-making skills. Equally important, the SimFX tool has the capability to be an aid in the development of the cognitive skills required for both the current force and for the envisioned future force environment.

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and Training Technology

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The hands-on workshop for the SimFX tool could not have been conducted without the full participation of its developers from Micro Analysis and Design, Inc. Special acknowledgement is given to this team of developers that included: Alan Brockett, who led the workshop, Rick Archer, Walter Warwick, and Patty McDermott. The participants of the workshop gave their full attention to the procedures used to introduce them to the SimFX tool and their completion of the SimFX Questionnaire. While the participants were insured their names would not be used in the reporting of the results, the author wishes to acknowledge the leaders of the Fort Benning activities and units that did authorize and encourage their participation. These Fort Benning activities and units include each of the following: Infantry Futures Group, TRADOC Systems Manager – Soldier, Directorate of Operations and Training, Henry Caro Noncommissioned Officer Academy, Combined Arms and Training Directorate, 3rd Brigade of the 3rd Infantry Division, and the 11th Infantry Regiment.

PRELIMINARY EVALUATION OF A NOVEL SIMULATION-BASED TOOL FOR TRAINING RAPID DECISION-MAKING SKILLS

EXECUTIVE SUMMARY

Research Requirement

The Army's Future Force concept exploits the opportunities made possible by advances in our capacity to quickly gather, organize, and distribute battlespace information available from multiple sensor and database systems. However, as systems are being planned to train the decision-making skills required by these advanced communication and information systems, there is a continuing need to develop the decision-making competence of small-unit leaders who operate in current conventional environments. A novel computer-based training tool, called the Simulated Field Exercise (SimFX) tool, was developed that takes into consideration various combinations of conventional and more technologically advanced operational environments. This report documents the approach and the results of a preliminary evaluation of the SimFX training tool.

Procedure

The SimFX was evaluated using the results from a questionnaire completed by 19 participants in a hands-on workshop conducted for a broad cross-section of trainers and training developers at Fort Benning, Georgia. One of the developers of SimFX demonstrated a full-mission scenario and two deliberative practice exercises. Then, each participant was encouraged to use and explore the properties of each training component of SimFX. The developer also demonstrated how an authoring tool could make changes to the full-mission scenario and create a new scenario from scratch.

Findings

This preliminary evaluation of the SimFX tool showed that the workshop participants believed it could be an effective tool for training information-processing and decision-making skills and that the users would be personally involved in the training they received. The participants also indicated that SimFX was relatively easy to use for training and for authoring existing and new training scenarios and practice exercises. Equally important, the SimFX tool was perceived as being an aid for the development of the cognitive skills required for both the current force and for the envisioned Future Force environment.

Utilization and Dissemination of Findings

The results of this preliminary evaluation of SimFX have been presented to senior leaders of Infantry training and training development at Fort Benning. These key Infantry training personnel have been invited to participate in a follow-on workshop designed to further the transition of this research product into the pool of training systems available to institutional activities and operational units.

PRELIMINARY EVALUATION OF A NOVEL SIMULATION-BASED TOOL FOR TRAINING RAPID DECISION-MAKING SKILLS

CONTENTS

List of Tables

Preliminary Evaluation of a Novel Simulation-Based Tool for Training Rapid Decision-Making Skills

INTRODUCTION

The Infantry Forces Research Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences is conducting research to evaluate the training potential of desktop simulations of dismounted Infantry operations (Beal, 2005; Beal & Christ, 2004, 2005; Centric, Beal, & Christ, 2005). The desktop simulations evaluated were developed to provide Infantry leaders with low-cost, repetitive opportunities to experience realistically the consequences of executing an operations order and the challenges inherent in making hasty changes to those orders in response to emerging tactical conditions. Generally, the declared purpose of these simulations was to train the types of cognitive skills needed by Infantry leaders to make optimal decisions in the current or contemporary operating environments.

However, in keeping with the Army's modernization plan, there is a simultaneous need to develop and evaluate desktop training tools that have a high potential to enhance the types of cognitive skills that would enable rapid decision making in the proposed future operating environment (Department of the Army, 2005). The Army's Future Force concept exploits the enormous opportunities made possible by advances in our capacity to quickly gather, organize, and distribute battlespace information. It can be argued that the transition from the current to the future operating environments may produce changes in the nature of the information-processing and decision-making skills currently required to achieve decision-making proficiencies (Mosier, 2001).

Several years ago the author developed a topic statement for the Small Business Innovation Research (SBIR) program that asked for the development of a computer-based system that could be used to train rapid decision-making skills of small unit leaders regardless of the level of technology used in their operating environment. The training tool was to be initially developed for use by dismounted Infantry platoon leaders but also have the capability to be used by leaders at both higher and lower echelons. Further, the emphasis of the tool was to train the leader's ability to access, integrate, and effectively use information from multiple sources to improve his decision-making proficiency. Finally, special importance was placed on the role of the information provided or available to the leader, but not on the source of the information, the format and structure of the information (i.e., its analog or digital format), or the means through which the information was presented (i.e., the user-system interface or knobology). Based on the quality of the background work and plans accomplished during a phase I effort, a phase II SBIR contract for this topic was awarded to Micro Analysis and Design (MAAD), Inc. During the phase II effort, MAAD developed a tool, called the Simulated Field Exercise or SimFX, that met the objectives of the SBIR topic.

Key Feature of SimFX

The one feature of SimFX that distinguishes it from other desktop simulations that have been evaluated at Fort Benning is that it uses a discrete, outcome-driven simulation for training leader decision making rather than a simulation driven by inputs from the virtual operating environment. (A more complete description of the concepts and methods that underlie the development of the SimFX training tool is provided in Appendix A.) Unlike most other desktop simulations, the approach used to create SimFX training scenarios does not depend on the development of an immersive virtual reality in which the user performs his small unit leader tasks. Consequently, the SimFX software does not need to model autonomous intelligent adversaries, and it does not need to adjust for differences in the simulated versus real world states to meet the training objectives. These features characteristic of most other desktop simulations make them hard to maintain and almost impossible to adjust for changes in the training tasks and conditions.

The outcome-driven simulation incorporated in SimFX exploits the cognitive realism that is created when the learner engages in an interactive, branching storyline. The SimFX simulation advances the leader from one decision point to the next, and, therefore, focuses the leaders on making decisions using information at their disposal rather than on their experiencing the subtleties of a virtual environment. The developer of SimFX utilized techniques to manage the size of the decision tree that drives the decision-making points in the story line. These techniques permit ground truth to be adjusted as necessary to meet the training objectives and permit easy modifications of a scenario and the creation of new scenarios.

It became apparent during an in-progress review meeting for this SBIR contract in mid-October 2005 that the SimFX tool had been developed to the point that it should be reviewed and evaluated by Infantry trainers and training developers at Fort Benning. The software development was sufficiently complete to support both authoring and execution of training scenarios. An in-house evaluation of the initial beta-version of the software established a proof of concept with a simple test bed scenario. The test of the beta software demonstrated successfully how decisions points of different types can be implemented to insure the face validity of the story line, and to produce an engaging training scenario. The developers created a doctrinally correct set of four full-mission scenarios and two deliberative practice exercises. The latter presented repeatedly a single type of decision task, e.g., deciding whether two images of an environmental feature were the same or different. It was decided that a revised beta-version of the SimFX software could be demonstrated during a hands-on workshop. This demonstration would provide a basis for conducting a preliminary evaluation of its potential for training in the Infantry community.

Purpose of This Report

This report documents the preliminary evaluation the SimFX training tool. The report provides a brief description of the procedures used for conducting a hands-on workshop in which SimFX was demonstrated. It also describes the outcome of the

workshop based on an assessment of the perceptions and opinions of the Infantry trainers and training developers who participated in the workshop.

METHOD

Participants

To encourage participation in the workshop, the author conducted a series of meetings to briefly describe the SimFX training tool and the hands-on workshop to the leaders of ten key training and training development activities and units across Fort Benning. In addition, the author provided information about the SimFX tool and the workshop to his colleagues in the Infantry Forces Research Unit and in two contractor firms. The contractor firms regularly provide support for training and training development to Fort Benning and to the Infantry Forces Research Unit. Eight of the invited Fort Benning activities and agencies, as well as the three civilian organizations sent representatives to the workshop. About 30 individuals participated in all or most of the workshop. Of these participants, 19 completed the questionnaire that provided the data used in this report.

Table 1 provides a general breakdown of the respondents who completed the questionnaire. It was possible to identify the status and the activity or unit represented by all but two of these respondents. The respondents were told that their responses to the questionnaire would be anonymous. There was no attempt to gather any information about the respondents' experience in Infantry training or training development. However, it is reasonable to conclude that most of the senior commissioned officers, noncommissioned officers (NCOs), and civilian respondents possessed considerable experience in these areas.

Table 1. Number of Respondents by Status and Agencies Represented

Status	Number of Respondents	Number of Different Agencies Represented
Military		
Officer	5	3
NCO	6	4
Civilian	6	3
Unknown	2	~

Note: Two of the 19 respondents elected not to provide their names and their status and affiliation could not be determined.

Procedure

The SimFX workshop was conducted in a classroom at Fort Benning in which each participant was able to use the SimFX software with his or her own desktop computer. The workshop began with an introductory presentation that lasted about 15 minutes by the lead member of the MAAD team. During this presentation the operating sets of assumptions and principles that drove the development of the SimFX training tool were described.

Following the introductory presentation, the participants were told to turn on their computers to access to the revised beta-version of SimFX. For the next fifteen minutes the lead contractor demonstrated the full-mission scenario and the two deliberative practice exercises that were contained in the software. The participants were encouraged to ask questions during this developer-led demonstration of the revised beta-version of the SimFX software.

During the next 60 minutes, the participants were encouraged to use and explore the properties of each component of the training software. While the participants used the SimFX tool, the lead developer and three of his colleagues (as well as the author) answered questions raised by the participants and provided information. At the conclusion of this 60-minute hands-on demonstration, the participants were told they could take a short 15-minute break. (Up to one-half the participants elected not to take a break or to take only an abbreviated break. These participants used some or all of the break time to continue investigating the properties of the SimFX training tool.)

Following the break, the lead developer demonstrated how the authoring tool could be used to make changes to the full mission scenario that was contained in the beta-version of SimFX software. He then demonstrated how the authoring tool could be used to create a new, three-node scenario from scratch. A hand-out was provided to the participants to guide them through this application of the authoring tool. During and following this demonstration, the participants were encouraged to raise questions or to offer comments to the developers. The demonstration of the authoring capability of the SimFX tool lasted about 30 minutes.

At the end of this final demonstration period, each participant was given a copy of the SimFX Questionnaire. The participants were encouraged to complete the SimFX Questionnaire before they left the classroom. The author collected all the questionnaires that were completed.

The SimFX Questionnaire

The SimFX Questionnaire was developed to capture the opinions of the participants about their experiences using the SimFX tool during the workshop. A copy of the questionnaire is given in Appendix D. Successive parts of the questionnaire asked the respondents to rate the following:

- Training value of the SimFX
- Extent to which users of SimFX would be personally involved with the training
- Ease of use or the usability of SimFX for training and for editing or authoring the training material presented with SimFX.

Participants also were asked to provide written comments about SimFX in terms of its advantages and disadvantages as a training tool and as an editing or authoring tool.

In the first two parts of the questionnaires, respondents used a seven-point rating scale to indicate their responses to questions about SimFX. In these two parts of the

questionnaire, a scale value of 1 reflected the most negative rating for SimFX, a scale value of 4 a neutral or indifferent rating, and a scale value of 7 the most positive rating for SimFX. In part three of the questionnaire, respondents used a five-point rating scale to indicate their reactions to positive statements about the usability of SimFX. The five scale values were verbally labeled Strongly disagree, Disagree, Neither agree nor disagree, Agree, and Strongly agree, and assigned numeric values of 1 through 5, respectively. Many of the items to be rated in the questionnaire were modified from those used to assess the training effectiveness of other Army simulation-based training tools (Beal & Christ, 2004, 2005).

In the last part of the questionnaire the respondents were asked to describe their overall opinions of the training and authoring capabilities of SimFX. They were asked to describe up to three positive and three negative features of SimFX for training and up to two positive and two negative features of SimFX for authoring training scenarios and exercises. Observations of and oral comments by the participants during the workshop were not formally recorded and are not presented in this report.

RESULTS

Rated Opinions About SimFX

Training value of the SimFX tool. The participants indicated that they believed the SimFX would have training value. Across the eleven items in this part of the questionnaire, between 68 and 95 percent of the respondents used one of the three highest rating categories to indicate a positive opinion of the training value of the SimFX. (Details of the ratings for training value are presented in Appendix Table C-1). The five items on which over half of the respondents used one of two most positive rating categories to indicate their opinion of the training value of the SimFX tool are listed below (in descending order of the percentage of respondents using one of these two rating categories).

- Would training with SimFX help small unit leaders focus on critical factors that influence tactical decisions?
- Would using SimFX provide a Soldier opportunity to practice making sound tactical decisions?
- Would training with SimFX be a valuable learning experience?
- Would training with SimFX improve a Soldier's ability to make more rapid tactical decisions?
- To what extent will training with SimFX help a Soldier to make sound tactical decisions?

User involvement during SimFX training. The participants indicated that users would become personally involved while training with the SimFX tool. Across the five questionnaire items that assessed this factor, between 52 and 95 percent of the participants used one of the three highest rating categories to indicate that a user would become involved with the SimFX training. (Details of the involvement ratings are presented in Appendix Table C-2). The two items on which over half the respondents

used one of two highest rating categories to indicate their belief that users would be personally involved during SimFX training are shown below (in descending order of the percentage of respondents using one of these two rating categories).

- How involved were you in the decision-making experiences provided by SimFX?
- How often might a Soldier training with SimFX be completely focused on the decision-making task?

Usability of SimFX as a training tool. The participants indicated that SimFX would be relatively easy to use and that they would use it as a training tool. Across the 19 items used to assess this aspect of the SimFX tool, between 61 and 100 percent of the respondents either agreed or strongly agreed with positive statements about the usability of SimFX for training. (Details of the ratings of SimFX usability for training are presented in Appendix Table C-3). The four items on which over a third of the respondents used the strongly agree rating category for the usability of SimFX for training are listed below (in descending order of the percentage of respondents using this highest rating category).

- If it were available, I would use SimFX as a training tool.
- If the SimFX tool were available I would use it to train my Soldiers.
- The "clock" shown in the SimFX display to indicate how much time remains to complete a mission was easy to understand.
- The steps required to use SimFX for training purposes are easy to perform.

Usability of SimFX for authoring training scenarios and exercises. The participants indicated they believed the SimFX software would make it relatively easy to modify existing training exercises and to create new ones more to their liking. They further indicated that if the software were available to them, they would exercise this capability. Across the 6 items in this part of the questionnaire, between 61 and 94 percent of the respondents either agreed or strongly agreed with positive statements about the usability of SimFX for training. (Details of the ratings for the usability of SimFX authoring capabilities are presented in Appendix Table C-4). The three items on which over a third of the respondents used the most positive rating category for the authoring capability of SimFX are listed below (in descending order of the percentage of respondents using the strongly agree rating category).

- If it were available, I would personally create some new SimFX scenarios or exercises.
- If it were available, I would personally modify existing SimFX scenarios or exercises.
- With just a little practice I could become very good at modifying and creating SimFX scenarios or exercises.

Written Comments About SimFX

Seventeen of the 19 respondents provided 101 written comments about positive and negative features of the SimFX tool. Sixteen respondents gave 36 positive comments and 15 gave 28 negative comments about SimFX training capabilities. Sixteen respondents gave 24 positive comments and 9 gave 13 negative comments about the authoring capability of SimFX. These written comments are provided in Appendix Tables C5-C8. The author's attempt to organize these written comments into meaningful clusters is reflected in these four appendix tables and is summarized in this section of the report.

Written comments about using SimFX for training. The respondents' positive comments about SimFX training followed a pattern similar to their rated opinions. The majority of the positive comments referred to the ease of using SimFX for training and its use specifically to train decision-making skills. Another cluster of the positive comments spoke specifically about the potential use of SimFX scenarios to accommodate other current and emerging training requirements.

Some of the negative comments about training with SimFX were concerned with details specific to the scenario that was demonstrated in the workshop. For example, remote and robotic sensor systems played a key role in the demonstrated scenario but most of the workshop participants were not familiar with the capabilities of these emerging technologies. However, most of the negative comments about using SimFX for training highlighted issues that are common to the use of many training tools, such as the difficulty inherent in developing good scenarios and conditions for training, the difficulty of getting computers to use for training, and the preference for live training. Other negative comments showed that some features of SimFX were not clearly demonstrated during the workshop.

Written comments about the SimFX authoring capability. Positive comments about the authoring capability of SimFX reinforced the rated opinions given for its usability. Most of the positive comments spoke to the relative ease of use and the flexibility provided by the authoring software. Many respondents indicated they would be able to tailor SimFX scenarios to fit their specific training requirements. Several respondents pointed specifically to the use of this capability to convert currently used paper-and-pencil-based decision exercises into SimFX scenarios and to use them in SimFX to enhance the training of tactical decision-making skills.

Most of the negative comments about SimFX authoring capability addressed perceived difficulties in learning how to author scenarios. Another cluster of negative comments were concerned with whether the authoring capability could be used to create scenarios for the current force that does not have access to the remote sensor technology that was highlighted in the demonstrated scenario.

DISCUSSION

The results showed clearly that the participants in the hands-on SimFX workshop thought the SimFX tool has the potential to effectively train decision-making skills. Most respondents gave very high ratings and wrote positive comments about the value and ease of using SimFX for training. Over half the respondents indicated that Soldiers would become involved in the training provided by the SimFX tool. Further, most respondents indicated that, if SimFX were available, they would use it to train decision-making skills. Some respondents specifically recommended that currently used paper-and-pencil decision-making exercises be converted into SimFX scenarios.

While the rated opinions of workshop participants were quite positive toward the training value of the SimFX tool, their written comments indicated also some perceived negative aspects of training with the SimFX tool. Many of these negative comments about training with SimFX were keyed to only the specific scenario that was demonstrated in the workshop. These perceived negative aspects of the SimFX scenario could be neutralized or reversed if the participants had been exposed to other training scenarios that did not employ remote and robotic sensors. The other problems noted by the respondents were generally applicable to all training tools and simulations (e.g., difficulty in preparing good training scenarios) or are a reflection of more widespread problems in acquiring training resources (e.g., scarcity of computers for training purposes).

The rated and written opinions of the workshop participants about the authoring capability built into the SimFX tool were more equivocal than those about its training capability. On the one hand, the respondents indicated that with a little practice they thought they would be able to use the authoring capability to modify existing scenarios as well as to create new scenarios to meet their training responsibilities. However, some respondents also indicated that it might be difficult to use the authoring capability of SimFX. One possible reason for the more ambivalent opinion about the authoring capability than the training capability of SimFX is that participants had hands-on experience using the training aspects of the SimFX tool but received only a description of its authoring capability. It is anticipated that planned future hands-on demonstration of both the training and the authoring capabilities of the final version of the SimFX tool will reinforce the positive user opinions of the tool and reduce if not eliminate any perceived problems with its use.

CONCLUSION

The findings of this preliminary evaluation of the SimFX tool suggest that the tool may be both an effective and an efficient means to train information-processing and decision-making skills. Equally important, the SimFX tool has the capability to aid to the development of the cognitive skills required for both the current force and for the envisioned future force environment. Given the relatively low level of development of the SimFX tool used in this evaluation, the short duration of the workshop used for this evaluation, and, most importantly, the absence of a hands-on demonstration of its authoring capability, it is important to conduct appropriate follow-on evaluations of this desktop training simulation as it is further refined and developed.

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Appendix A. A description of the SimFX training Tool

SIMULATION BASED TRAINING FOR THE FUTURE FORCE WARRIOR *

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Abstract: In this paper we describe techniques we have adopted to develop a computer-based, outcome-driven simulator to train digital information skills for small unit leaders of the Army's Future Force Warrior program. We begin by contrasting attempts to engender "virtual realism" in simulation based training against attempts to engender cognitive realism by way of the branching storylines at the heart of an outcome-driven simulation. We next present an example of how such an approach might be applied to train digital information skills before turning to a more general discussion of the problems that such an approach entails—namely, crafting an engaging story while minimizing the combinatorial explosion in a branching storyline. We describe how we have dealt with these problems both by streamlining storylines and by decoupling student input from the branching process. Finally, we allude to a software tool we have created that allows the training developer to author and execute such outcome-driven simulations.

INTRODUCTION

Realism is an essential component of simulation-based training. For many computer-based simulations, this realism is accomplished with the construction of a highly detailed, carefully rendered, synthetic environment coupled with some sort of input device that allows the student to interact with the simulated environment. So-called virtual reality permits the student to explore the simulated training environment in real-time, in a perceptual-motor situation similar to the real world. In principle, anything the student might do in the actual environment could be done via simulation in a virtual environment. As long as the simulated environment reflects the salient interactions of the actual environment, the student can gain valuable experience performing tasks that are either too dangerous, or too expensive, or simply impossible to perform in the actual environment. While effective for some types of training, immersion in a virtual reality comes with its own issues and significant overhead that do not justify its application in every training domain. (In fact, it is not clear that highly realistic synthetic environments provide useful training for dismounted Soldiers. Cf. Pleban (2003), Christ (2004)) *Outcome-driven* simulation has recently emerged as one possible alternative (e.g., Gordon, 2004). In outcome-driven simulation the goal is no longer to immerse the student in a virtual reality but, rather, to exploit the cognitive realism that follows from engaging the student in a story or vignette where the student must make a series of decisions that ultimately affects how the story plays out.

Outcome-driven simulation trades the continuous environment of virtual reality for a set of discrete choice points built into a narrative structure. By scripting together a series of choice points in a branching storyline, the training developer maintains control over the interactions

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between student and simulation—ensuring that the student will encounter specific decisions at specific times rather than wandering aimlessly or unpredictably through a virtual environment. However, crafting the branching story line that constitutes an outcome-driven simulation places a significant burden on the developer to come up with an engaging yet tractable scenario. If the training developer constructs a scenario with too few choice points he runs the risk of constructing a simulation that is no more engaging than a short multiple choice exam. At the other extreme, if the developer tries to string together too many choice points he will quickly find himself lost in a combinatorial explosion. The training developer must strike a balance between engaging the student and managing the complexity of a scenario maintaining all the while some semblance of continuous flow and believability throughout the scenario, no matter which choices the trainee makes.

In this paper we describe how we have struck such a balance in the development of a computer-based, outcome-driven training simulator. The simulator is intended to train the small unit leaders of the U.S. Army's Future Force Warrior (FFW) program to make sense of the ever wider array of information technologies available as the Army transforms itself to fight on the "digital battlefield." The emphasis on digital technology and the ability of the Soldier to fuse information from various sources makes this domain especially well suited to an outcome-driven simulation. A series of discrete choice points can be used to present the Soldier with particular pieces of information that must be fused to make the "right" decision (i.e., the decision that allows the scenario to unfold in the manner intended by the training developer). Still, crafting the training scenarios has been far from trivial. We describe below how we have exploited some of the "chapter-based" techniques from Gordon (2004) to manage combinatorial explosion, along with insights from the gaming community that inspired us to decouple the overt choices made by the student from those that actually dictate the flow of control through the scenario. In this way we present the illusion that the student is interacting with a simulated world that exists independently without incurring the overhead that would otherwise be necessary to maintain a consistent world state. We also allude to a general software tool we've built that allows us to implement these techniques in the development of computer-based, outcome-driven training scenarios.

SCENARIOS TO TRAIN DIGITAL SKILLS FOR THE FFW

Although a good deal has been written recently about the impacts of digital technologies and their implications for training, our work was motivated by the straightforward observation that expertise is generally built on a foundation of hands-on experience. So, rather than focus training on the specifications and capabilities of new digital technologies—the "knobology" of new technology—we set out to provide students with computer-based scenarios that would force them to resolve ambiguous or contradictory sensor readings, fuse disparate sources of information, filter information, manage resources, (e.g., time, network bandwidth) and learn how to employ sensors to the greatest effect in a tactical situation.

For example, at one decision point we might ask the student to pick among three routes to a waypoint. The paths are presented on an electronic display of a map. The student has the ability to query various information sources. In addition to traditional information sources (e.g., an operations order, radio communications, map overlays) the student can query unattended acoustic sensors, reconnaissance from unmanned air and ground vehicles and spot reports from a

densely connected communications network. Choosing the correct path means querying the appropriate sensor and making good use of the information it provides. In this case, the decision was crafted so that the student must recognize that the indication of foot traffic reported by an unattended acoustic sensor in the vicinity of one route is inherently ambiguous and that the determination of whether it is due to enemy or friendly activity along the route depends on querying another sensor—perhaps inspecting recent aerial reconnaissance. The choice can be further complicated by layering tactical considerations and time management demands (e.g., the shortest route offers less cover).

Although seemingly straightforward, implementing this decision point depended on the solutions to several interrelated questions. First, we had to decide how information would be presented. While we wanted to preserve the "look and feel" of the information sources, we didn't want the student to become mired in the painstaking analysis of a grainy reconnaissance photograph or the interpretation of a particular acoustic signature in a noisy signal. Instead, we opted to present information from these sources abstractly (usually as text-based reports from a notional intelligence analyst who reviews sensor data), to emphasize how the student should integrate such facts once presented rather than train interpretation of raw data. More generally, the abstract representation reflects the desire to steer away from a detailed underlying model where a consistent "world state" can be maintained and presented to the student (via additional and comparably complex sensor models). Instead, the training developer simply specifies the information provided to the student at each decision point, tweaks the simulated world as necessary (e.g., adding enemies at a location, removing assets), much in the same way that a so-called observer-controller will change the course of a live training exercise to suit the training objectives. But while the training developer gains greater control of the simulation in this way, it comes at a cost. Without detailed, underlying models to maintain a consistent world state, it falls on the training developer to manage the complexity and consistency of the unfolding scenario. As indicated above, managing this complexity is difficult.

Even with only a few choices at each decision point, keeping track of all the possible paths through a scenario becomes unmanageable after a handful of decisions. While some degree of combinatorial explosion is inevitable, it can be minimized in a number of ways. First, as Gordon (2004) describes, a branching scenario can be pruned by introducing "chapters" whereby a series of decisions ultimately funnel back to a single decision. For example, we ask the student a short series of questions, each of which asks where he'd move to next given the available information sources (which change from decision to decision). But rather than ramify the student's decisions throughout the entire scenario, we introduce a new series of questions by discontinuously moving the student to a new location that could plausibly be reached no matter which route the student chose previously.

A second technique for minimizing combinatorial explosion is simply to avoid it in the first place by posing non-branching decisions. Such decisions either ask the student to provide factual responses about digital technologies (e.g., "Can your unmanned acoustic sensor field at the objective detect truck traffic on the road just east of the objective?"), or we can ask the student to estimate the resources required to execute particular phases of the mission, or, finally, use rhetorical strategies to force the student to deepen his thought about the tactical situation (e.g., "Have you considered how your operational tempo would be affected if your were flanked

en route to the objective?"). While the student will be prompted for a response, the response does not change how the scenario advances.

Finally, borrowing techniques from the gaming community, we have found it is possible to present the student with a seemingly genuine decision (i.e., a choice that affects outcomes) without having to represent those outcomes in the scenario. The trick here is not to predicate the outcome of the decision on what the student actually chooses, but rather, on what the student knew or should have known before he made his choice (which we can infer by keeping track of which information assets were queried). Much in the same way that a video game designer will program a monster to appear in whatever room the player enters, we can ensure that bad things will happen whenever a student fails to make the best use of the information assets at his disposal. Returning to our earlier example, independent of route the student actually chooses, we can place an enemy ambush whenever the student fails to disambiguate the reports from his acoustic sensors. Conversely, the enemy will be absent whenever the appropriate combination of sensors is queried and we will reward the student for recognizing the original ambiguity, thus reinforcing the training objective. While this style of question requires the training developer to specify training feedback (i.e., outcomes) for a potentially large number of sensor combinations, it allows scenarios, or large parts of them, to be developed without any branching and so the level of effort tends to grow linearly rather than exponentially in the depth of the scenario.

DISCUSSION

We built a software tool that allows us to implement all three styles of decision points. The training developer is able to specify the scenario structure using a Decision Tree Editor (depicted in Figure 1 below). The Decision Point Editor (depicted in Figure 2 below) allows the training developer to specify each decision point, including the information that will be available, the choices the student can make and the feedback the student will receive.

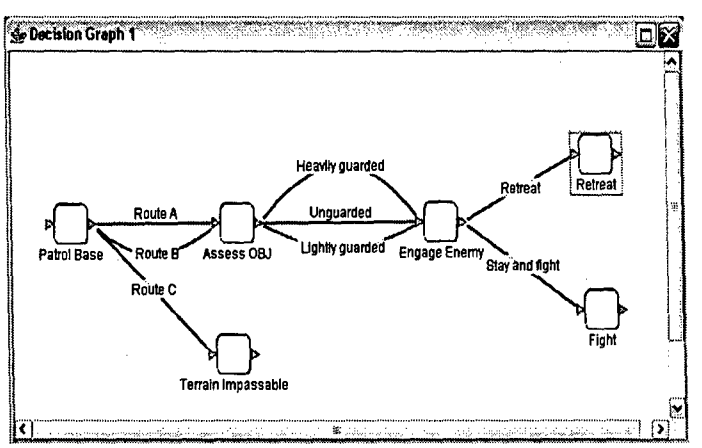


Figure 1 Decision Tree Editor

Appendix A. A description of the SimFX training Tool

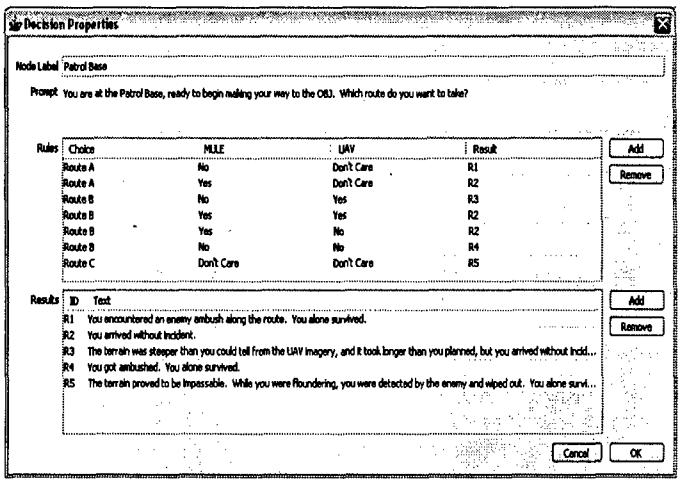


Figure 2 Decision Point Editor

Our effort to date has been on software development, as opposed to content development. We have created simplistic scenarios to anchor intuitions and focus our efforts, but our real interest is in tool development (although we have just begun working with an infantry subject matter expert to develop more robust training scenarios). Accordingly, our focus on evaluation has been limited to the usability of the software and its ability to represent the kinds of information-rich decision points we think might be important training points for the FFW. The evaluation of training effectiveness will have to wait until richer content can be developed.

While our approach places a non-trivial demand on the developer to produce a well-crafted outcome driven scenario, the required effort pales in comparison to that required to develop, maintain and use more immersive simulation environments. At the other extreme, we are inspired by a generation of paper and pencil exercises, called Tactical Decision Games, that the U.S. Marines use to suspend disbelief and engage the story behind the training scenario. We see our approach as a middle road between high-fidelity simulations and pencil-and-paper exercises.

References

Beal, S.A. & Christ, R.E. (2004). *Training Effectiveness Evaluation of the Full Spectrum Command Game* (Technical Report 1140). Arlington, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Gordon, A. (2004). Authoring Branching Storylines for Training Applications. *Proceedings of the Sixth International Conference of the Learning Sciences (ICLS-04)*, Santa Monica, CA.

Pleban, R. J. & Salvetti, J. (2003). *Using Virtual Environments for Conducting Small Unit Dismounted Mission Rehearsals* (Research Report 1806). Arlington, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Appendix B. SimFX Questionnaire

Simulated Field Exercise (SimFX) Tool Questionnaire

Print your full name_____

Please note: *Your name and your responses to this questionnaire will never be made public. ARI might use your name if it wishes to contact you to follow-up on your experiences with SimFX.*

Based on your admittedly short experience with SimFX and on your experience as a trainer in the Infantry, respond to the questions in Parts 1 and 2 of this questionnaire by marking an "X" in the appropriate box of the 7-point scale. Please consider the entire 7-point scale before making your responses.

Part 1. Overall Potential Training Value of SimFX

1. Would using SimFX provide a Soldier opportunity to practice making sound tactical decisions?

NO OPPORTUNITY			SOME OPPORTUNITY			GREAT OPPORTUNITY

2. Would training with SimFX improve a Soldier's ability to make more rapid tactical decisions?

WILL NOT IMPROVE			MAY IMPROVE			WILL DEFINITELY IMPROVE

3. Would training with SimFX make a Soldier more confident in his ability to make tactical decisions?

NOT MORE CONFIDENT			SOMEWHAT MORE CONFIDENT			MUCH MORE CONFIDENT

4. How challenging is the overall experience provided by training with SimFX?

NOT CHALLENGING			MODERATELY CHALLENGING			VERY CHALLENGING

5. Would training with SimFX have a valuable impact on small unit leaders?

NO VALUE			SOME VALUE			GREAT VALUE

6. Would training with SimFX help small unit leaders focus on critical factors that influence tactical decisions?

NO FOCUS			SOME FOCUS			EXCELLENT FOCUS

7. To what extent could SimFX teach the Soldier something new about decision making that is not now or not easily covered in normal classroom or field training?

NOT AT ALL			SOMEWHAT			VERY MUCH

Continue on the next page

Appendix B. SimFX Questionnaire

8. To what extent will training with SimFX help a Soldier to make sound tactical decisions?

9. To what extent will training with SimFX permit a Soldier to practice the types of decisions he must make as a small unit leader?

10. Would training with SimFX be a valuable learning experience?

11. As a trainer, how satisfied were you with the training opportunities provided by SimFX?

Part 2. User Involvement or Immersion in SimFX

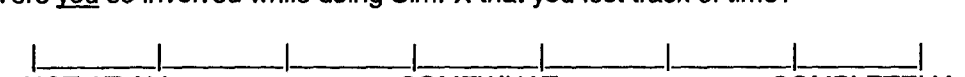
1. How captivated or drawn in would a Soldier be by the tactical events and actions presented in SimFX?

2. How often might a Soldier training with SimFX be completely focused on the decision-making task?

3. How involved were <u>you</u> with tactical events and actions portrayed in SimFX?

4. How involved were <u>you</u> in the decision-making experiences provided by SimFX?

5. Were <u>you</u> so involved while using SimFX that you lost track of time?



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Appendix B. SimFX Questionnaire

Part 3. The Degree to Which SimFX is Easy or Difficult to Use

In Part 3 of the questionnaire draw a circle around the letter that best indicates the extent to which you agree or disagree with each statement. Write the letters **NA** to the left of the statement number to indicate that you have no basis for having an opinion about the statement.

	Strongly agree	*Agree*	*Neither agree nor disagree*	*Disagree*	*Strongly disagree*
Section A: Using SimFX to Train Decision-Making Skills					
1. If it were available, I would use SimFX as a training tool.	A	B	C	D	E
2. The steps required to use SimFX for training purposes are easy to perform.	A	B	C	D	E
3. The abbreviated operations order provided to the user at the beginning of a scenario were adequate to understand the training mission.	A	B	C	D	E
4. The description of the factors that defined each decision point were adequate for the purpose of the training exercise.	A	B	C	D	E
5. The types of decision-making tasks possible with SimFX are similar to those encountered in an operational environment.	A	B	C	D	E
6. It was easy to request and obtain information while executing the mission.	A	B	C	D	E
7. The reporting process was adequate to keep my CO informed.	A	B	C	D	E
8. The signals used on the SimFX screen for alerting the user that a source of information is available were easy to understand.	A	B	C	D	E
..9. The printed text-based information available to the user of SimFX were easy to understand.	A	B	C	D	E
10. The printed text-based information available to the user of SimFX were useful for selecting a course of action at the decision point.	A	B	C	D	E
11. The graphic- or photographic image-based information available to the user of SimFX were easy to understand.	A	B	C	D	E
12. The graphic- or photographic image-based information available to the user of SimFX were useful for selecting a course of action at the decision point.	A	B	C	D	E
13. The time pressure SimFX imposes on the decision maker is appropriate.	A	B	C	D	E
14. The planning map provided an appropriate amount of detail.	A	B	C	D	E
15. The "clock" shown in the SimFX display to indicate how much time remains to complete a mission time was easy to understand.	A	B	C	D	E

Continue on the next page

Appendix B. SimFX Questionnaire

	Strongly disagree	*Disagree*	*Neither agree nor disagree*	*Agree*	*Strongly agree*
Section A: Using SimFX to train decision-making skills (continued)					
16. The alternative courses of action provided with each decision point are similar to those likely to arise in an operational environment.	A	B	C	D	E
17. SimFX can be used to train Soldiers about the proper use of robotic sensors.	A	B	C	D	E
18. The feedback provided following a decision was appropriate for the purpose. of training decision-making skills.	A	B	C	D	E
19. If the SimFX tool were available I would use it to train my Soldiers.	A	B	C	D	E

Section B. Using SimFX to modify/create mission scenarios and practice exercises

1. If it were available, I would personally modify existing SimFX scenarios or exercises.	A	B	C	D	E
2. If it were available, I would personally create some new SimFX scenarios or exercises.	A	B	C	D	E
3. The procedures for modifying or creating a SimFX scenario or exercise are quite logical.	A	B	C	D	E
4. The steps required to modify an existing SimFX scenario or exercise are easy to perform.	A	B	C	D	E
5. The steps required to create a new SimFX scenario or exercise are easy to perform.	A	B	C	D	E
6. With just a little practice I could become very good at modifying and creating SimFX scenarios or exercises.	A	B	C	D	E

Part 4. Overall Opinion of the SimFX for training the decision-making skills

Section A. The training capabilities of SimFX

1. What would be the chief advantages for using SimFX as a tool for training the decision-making skills of small unit leaders? Describe up to three positive features of SimFX for training that would encourage you to use it as a training tool.

_____

_____

_____

2. What would be the chief disadvantages for using SimFX as a training tool for improving the decision-making skills of small unit leaders? Describe up to three negative features of SimFX for training that would prevent you from using it as a training tool.

_____

_____

_____

Section B. The authoring capabilities of SimFX to modify/create scenarios or exercises

1. Describe up to two positive features of the authoring capabilities of SimFX.

_____

_____

2. Describe up to two negative features of the authoring capabilities of SimFX.

_____

_____

If you wish to be kept informed about the final status of this research product please print your phone number and e-mail address below.

Phone number: _____

Email address: _____

Thank you for participating in this demonstration of SimFX and for completing this questionnaire.

ARI POC: Dr. Richard E. Christ
706-545-2207, ChristR@benning.army.mil

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-1. Results for Part 1: Overall Potential Training Value of SimFX

Item Number and Item	Statistic			Percentage of Participants						
				Rating						
	N	M	SD	1	2	3	4	5	6	7
01. Would using SimFX provide a Soldier opportunity to practice making sound tactical decisions?	19	5.8	0.9	~	~	~	5.3	31.6	42.1	21.1
02. Would training with SimFX improve a Soldier's ability to make more rapid tactical decisions?	19	5.6	0.9	~	~	~	15.8	21.1	52.6	10.5
03. Would training with SimFX make a Soldier more confident in his ability to make tactical decisions?	19	5.5	1.0	~	~	~	10.5	52.6	15.8	21.1
04. How challenging is the overall experience provided by training with SimFX?	19	4.8	1.4	~	10.5	5.3	15.8	36.8	26.3	5.3
05. Would training with SimFX have a valuable impact on small unit leaders?	19	5.5	0.9	~	~	~	10.5	47.4	26.3	15.8
06. Would training with SimFX help small unit leaders focus on critical factors that influence tactical decisions?	19	5.8	0.9	~	~	~	10.5	15.8	57.9	15.8
07. To what extent could SimFX teach the Soldier something new about decision making that not now or not easily covered in normal classroom or field training?	19	5.1	1.1	~	~	5.3	26.3	31.6	26.3	10.5
08. To what extent will training with SimFX help a Soldier to make sound tactical decisions?	19	5.5	0.8	~	~	~	15.8	26.3	52.6	5.3
09. To what extent will training with SimFX permit a Soldier to practice the types of decisions he must make as a small unit leader?	19	5.4	0.9	~	~	~	10.5	57.9	15.8	15.8
10. Would training with SimFX be a valuable learning experience?	19	5.7	0.8	~	~	~	5.3	31.6	47.4	15.8
11. As a trainer, how satisfied were you with the training opportunities provided by SimFX?	19	5.5	0.8	~	~	~	5.3	47.4	36.8	10.5

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-2. Results for Part 2: User Involvement or Immersion in SimFX

Item Number and Item	Statistic			Percentage of Participants Rating						
	N	M	SD	1	2	3	4	5	6	7
01. How captivated or drawn in would a Soldier be by the tactical events and actions presented in SimFX?	19	5.1	0.9	~	~	5.3	10.5	57.9	21.1	5.3
02. How often might a Soldier training with SimFX be completely focused on the decision-making task?	18	5.7	0.9	~	~	~	5.6	44.4	27.8	22.2
03. How involved were you with tactical events and actions portrayed in SimFX?	19	5.6	1.2	~	~	5.3	10.5	36.8	15.8	31.6
04. How involved were you in the decision-making experiences provided by SimFX?	19	5.7	0.8	~	~	~	5.3	36.8	42.1	15.8
05. Were you so involved while using SimFX that you lost track of time?	19	4.4	1.6	5.3	5.3	21.1	15.8	21.1	26.3	5.3

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-3. Results of Part 3: The Degree to Which SimFX is Easy or Difficult to Use.
Section A: Using SimFX to Train Decision-Making Skills

Item Number and Item	Statistic			Percentage of Respondents Rating				
	N	M	SD	1	2	3	4	5
01. If it were available, I would use SimFX as a training tool.	19	4.4	0.7	~	~	10.5	36.8	52.6
02. The steps required to use SimFX for training purposes are easy to perform.	18	4.2	1.0	5.6	~	5.6	50.0	38.9
03. The abbreviated operations order provided to the user at the beginning of a scenario were adequate to understand the training mission.	18	4.0	0.8	~	5.6	16.7	50.0	27.8
04. The description of the factors that defined each decision point were adequate for the purpose of the training exercise.	19	3.9	0.9	~	10.5	10.5	57.9	21.1
05. The types of decision-making tasks possible with SimFX are similar to those encountered in an operational environment.	18	3.6	0.8	~	11.1	27.8	55.6	5.6
06. It was easy to request and obtain information while executing the mission.	19	3.7	0.9	~	10.5	26.3	47.4	15.8
07. The reporting process was adequate to keep my CO informed.	19	3.8	0.6	~	~	31.6	57.9	10.5
08. The signals used on the SimFX screen for alerting the user that a source of information is available were easy to understand.	19	3.9	0.8	~	5.3	15.8	57.9	21.1
09. The printed text-based information available to the user of SimFX was easy to understand.	19	4.1	0.5	~	~	5.3	78.9	15.8
10. The printed text-based information available to the user of SimFX were useful for selecting a course of action at the decision point.	19	3.9	0.7	~	5.3	15.8	63.2	15.8

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-3. (Continued)

Item Number and Item	Statistic			Percentage of Respondents Rating				
	N	M	SD	1	2	3	4	5
11. The graphic- or photographic image-based information available to the user of SimFX were easy to understand.	19	4.2	0.4	~	~	~	78.9	21.1
12. The graphic- or photographic image-based information available to the user of SimFX were useful for selecting a course of action at the decision point.	19	4.0	0.6	~	~	15.8	68.4	15.8
13. The time pressure SimFX imposes on the decision maker is appropriate.	18	3.8	1.0	5.6	5.6	11.1	55.6	22.2
14. The planning map provided an appropriate amount of detail.	18	3.7	0.8	~	5.6	33.3	44.4	16.7
15. The "clock" shown in the SimFX display to indicate how much time remains to complete a mission time was easy to understand.	19	4.4	0.6	~	~	5.3	52.6	42.1
16. The alternative courses of action provided with each decision point are similar to those likely to arise in an operational environment.	18	3.7	0.8	~	5.6	27.8	55.6	11.1
17. SimFX can be used to train Soldiers about the proper use of robotic sensors.	19	3.7	0.9	~	10.5	26.3	47.4	15.8
18. The feedback provided following a decision was appropriate for the purpose of training decision-making skills.	19	3.7	0.7	~	5.3	31.6	52.6	10.5
19. If the SimFX tool were available I would use it to train my Soldiers.	18	4.3	0.7	~	~	11.1	44.4	44.4

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-4. Results for Part 3. The Degree to Which SimFX is Easy or Difficult to Use.
Section B: Using SimFX to Modify/Create Mission Scenarios and Practice Exercises

Item Number and Item	Statistic			Percentage of Participants Ratings				
	N	M	SD	1	2	3	4	5
01. If it were available, I would personally modify existing SimFX scenarios or exercises.	19	4.4	0.8	~	5.3	5.3	31.6	57.9
02. If it were available, I would personally create some new SimFX scenarios or exercises.	18	4.6	0.6	~	~	5.6	33.3	61.1
03. The procedures for modifying or creating a SimFX scenario or exercise are quite logical.	18	4.1	0.8	~	5.6	11.1	55.6	27.8
04. The steps required to modify an existing SimFX scenario or exercise are easy to perform.	18	3.8	0.9	~	5.6	33.3	38.9	22.2
05. The steps required to create a new SimFX scenario or exercise are easy to perform.	18	3.9	0.9	~	5.6	22.2	44.4	27.8
06. With just a little practice I could become very good at modifying and creating SimFX scenarios or exercises.	18	4.2	0.7	~	~	16.7	44.4	38.9

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-5. Positive Written Comments About Using SimFX for Training (Respondent ID)

Simple to use (5)
Flexible (11)
Easy to understand and use (15)
Easy to use (19)
Able to make up your own scenarios (19)
Easy to adjust scenarios (5)
This system appears to be unlimited in its capabilities as a training tool. The only limitation would be the trainer and his scenarios. (12)
Can be developed by the trainer to suit his situation (14)
The scenarios can easily be modified to teach a wide variety of decision making skills. (17)
Visual aid to tactical exercise (11)
Graphics (19)
Expand data base of exercises in unit (11)
Making good decisions (19)
Allows the exercise to focus on decision making (14)
Requires quick sound decisions (1)
Requires quick decision with limited info (3)
The time limits make them form decisions quickly, as well as analyze info. quickly (10)
Allows PLs to practice making decisions in a time constrained environment (9)
Allows Jr. leaders to practice skills involved in decision making such as map reading and graphic control measures (9)
It makes Soldiers form decisions with limited information in a safe environment (10)
Great way for leader to learn how **not** to make hasty decision (think first) (18)
Post H-hour decision making skills are hard to replicate for Co commanders. This is an option. (8)
Enables one to actually *execute* as opposed to simply planning an operation (7)
Teaches you to utilize assets (1)
Build confidence not only in the Soldier but confidence on using technology (5)
Gets reader to think about resources available (18)
Forcing Soldiers to use available assets and *inform higher* will teach them to do so (10)
Reminds you to *communicate with higher* (1)
Gives real world feedback without spending the money for troops or supplies (6)
It gives feedback to student on the spot (4)
Soldier can use SimFX as an AAR tool to iron out SOPs (6)
It takes away all distractions normally involved with field training exercises (6)
The user is drawn into the scenario and is actively engaged which promotes learning. (17)
Use to reinforce doctrine, tactics, or what ever you choose (8)
Allows me to set up more realistic responses (3)
Doesn't require a lot of computer space (14)
Do not need to "train" the Soldier on the actual software before training them on the content (17)

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-6. Negative Written Comments About Using SimFX for Training (Respondent ID)

More to fighting than robotic sensors (7)
It may put the platoon in a failed situation because the PL did not check an *asset* which is not realistic. (10)
Many of the *assets* are not available at the platoon level and might confuse things (10)
Automation usage (11)
Time required to develop scenario (14)
It takes some time for instructors to develop the scenarios (17)
The scenarios need to be doctrinally correct in order to not confuse junior leaders or teach them the wrong information (9)
Scenarios must be carefully designed and reviewed to insure that no negative actions are reinforced – especially actions that are peripheral to the main objective (15)
It takes engaged instructors to provide additional feedback and teaching points to the students (17)
Need to develop new icons for conventional units (14)
To design and input a Co-level activity with appropriate options, graphics, etc. would be a major task (8)
The need for computers to get everyone training on the same day (1)
Lack of computers (3)
Soldiers are sometimes skeptical about using simulations to train. (They would rather train in the field.) (17)
Nothing fully replaces "boots on the ground" (1)
Sometimes there is no correct answer, not everything you do on the battlefield is black and white (3)
A student is relying on the SimFX answer (4)
Mission change/ Programmed response (11)
From what I experienced, it doesn't allow for different types of platoons, such as mechanized, lights, or mortar, etc. (10)
Limited storyline (11)
As you make decisions it should show visual progress on the map (19)
Overlays should stay up at all times (6)
You have to start over with every fatal decision –should restart from there (6)
Viewing in the 1st person as opposed to icons to on a map is more effective (7)
No stress involved (2)
No overall statement of strengths or weaknesses of decision making skills (6)
Some trainers (SMEs) do not fully understand the nature of their own expertise (14)

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-7. Positive Written Comments About Using SimFX for Authoring (Respondent ID)

Easy system to understand. User friendly (8)
Simple (2)
Looks simple (11)
Looks flexible (11)
Seems to be simple (12)
Very easy to use! (17)
Able to change the icons (19)
Ability to use desired terrain (7)
The ability to add images, photos, etc. (1)
It allows the instructor to change the scenario to include assets or delete assets. This feature can make SimFX more applicable to the current force capabilities (10)
Point and click (15)
Word worksheet to develop initial scenario (14)
Branching chart to visualize learning path (14)
A unit can create scenarios tailored to its unit mission (1)
Very flexible – can create a wide array of scenarios (17)
You can tailor make it to your mission (6)
Set up how you want (3)
Create training specific to your unit (3)
Able to change with little effort (4)
Work well with every changing COE (4)
It evolves as the mission continues (6)
This would be great for QDXs for the NCOA schools for tactics (5)
I think the system would allow you to take current TDEs and convert them to SimFX (9)

Appendix C. Detailed Results from the SimFX Questionnaire

Table C-8. Negative Written Comments About Using SimFX for Authoring (Respondent ID)

It will take a little time to become familiar with the software (17)
To design and input a Co-level activity with appropriate options, graphics, etc. would be a major task (8) [same comment made with respect to SimFX training value]
Would tale a long time to truly depict reality (7)
It puts more pressure on the instructor to develop new scenarios or modification to the old ones (10)
Different instructors may modify it differently, so there is not one standard in a company or battalion (10)
On the current battlefield we set battle updates as mission changes. I think some scenarios that should happen because it will adjust the thinking process of the Soldiers (6)
Depending on author's perception can force students on what to think, not how to think (7)
Enough features to create scenarios for the current force to use? (It was hard to know this from the demo.)
A good addition might be short audio input for voice messages
Programmed enemy actions
% of occurrence
Software should keep the overlay displayed